

CLAIMS

1. An electromagnetic transducer comprising:
a first diaphragm;
5 a second diaphragm provided in a central portion of the first diaphragm, the second diaphragm comprising a magnetic material having a first opening in a central portion thereof;
a yoke disposed so as to oppose the first diaphragm;
10 a center pole disposed between the yoke and the first diaphragm, wherein the center pole has a shape which allows insertion into the first opening;
a coil disposed so as to surround the center pole;
and
15 a first magnet disposed so as to surround the coil.
2. An electromagnetic transducer according to claim 1, wherein the first diaphragm has a second opening in which the center pole can be inserted.
- 20 3. An electromagnetic transducer according to claim 1, wherein an upper face of the center pole is level with or higher than a lower face of the second diaphragm.
- 25 4. An electromagnetic transducer according to claim 1, further comprising a first thin magnetic plate disposed between the first magnet and the first diaphragm.
5. An electromagnetic transducer according to claim 1,
30 wherein the center pole has a diameter which varies along a height direction thereof.
6. An electromagnetic transducer according to claim 5,

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wherein the diameter of the center pole varies in such a manner as to represent a quadratic curve with respect to the height of the center pole.

- 5 7. An electromagnetic transducer according to claim 1, wherein the second diaphragm has a larger thickness at an inner periphery than at an outer periphery thereof.
8. An electromagnetic transducer according to claim 1, wherein the second diaphragm is turned up or down at an inner periphery thereof so as to have a substantially L-shaped cross section.
- 10 8. An electromagnetic transducer according to claim 1, wherein the second diaphragm is turned up or down at an inner periphery thereof so as to have a substantially L-shaped cross section.
9. An electromagnetic transducer according to claim 1, further comprising a cover for covering the first opening in the second diaphragm.
- 15 9. An electromagnetic transducer according to claim 1, further comprising a cover for covering the first opening in the second diaphragm.
10. An electromagnetic transducer according to claim 9, wherein the cover is integral with the first diaphragm.
- 20 10. An electromagnetic transducer according to claim 9, wherein the cover is integral with the first diaphragm.
11. An electromagnetic transducer according to claim 1, further comprising a second magnet provided so as to be on an opposite side of the second diaphragm from the yoke.
- 25 11. An electromagnetic transducer according to claim 1, further comprising a second magnet provided so as to be on an opposite side of the second diaphragm from the yoke.
12. An electromagnetic transducer according to claim 11, further comprising a second thin magnetic plate provided so as to be on an opposite side of the second magnet from the yoke.
- 30 12. An electromagnetic transducer according to claim 11, further comprising a second thin magnetic plate provided so as to be on an opposite side of the second magnet from the yoke.
13. An electromagnetic transducer according to claim 1, further comprising a first housing for supporting the first diaphragm.

14. An electromagnetic transducer according to claim 11, further comprising a second housing for supporting the second magnet.

5 15. A portable communication device comprising an electromagnetic transducer according to any one of claims 1 to 14.

10 16. A portable communication device according to claim 15, further comprising an antenna for receiving radiowaves and a transmission/reception circuit for converting the radiowaves into a voice signal, wherein the electromagnetic transducer reproduces the voice signal.

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